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Autonomy-supportive teaching: Its malleability, benefits, and potential to improve educational practice

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ABSTRACT

Autonomy-supportive teaching is the adoption of a student-focused attitude and an understanding interpersonal tone that enables the skillful enactment of seven autonomy-satisfying instructional behaviors to serve two purposes—support intrinsic motivation and support internalization. Using self-determination theory principles and empirical findings, researchers have developed and implemented numerous teacher-focused and methodologically-rigorous interventions to provide teachers with the professional developmental experience they need to learn how to become more autonomy supportive. The findings from 51 autonomy-supportive teaching interventions (including 38 randomized control trials) collectively show that (1) teachers can learn how to become more autonomy supportive during instruction (autonomy-supportive teaching is malleable) and, once learned, (2) this greater autonomy-supportive teaching produces a wide range of educationally important student, teacher, and classroom climate benefits (autonomy-supportive teaching is beneficial). Recognizing this, the article shows how the recent surge in autonomy-supportive intervention research has advanced the conceptual understanding of the nature of autonomy-supportive teaching and clarified its potential to improve educational practice.

Students show initiative, learn new information, and help their classmates more in some classes than in others. These manifestations of engagement, learning, and prosocial behavior occur mostly in classrooms that afford students recurring opportunities to experience motivational satisfactions. Many classroom factors explain the rise and fall of students' motivation (Ryan & Deci, 2017) and learning (Hattie, 2009), but one of the most important is the teacher's motivating style—the most frequently studied of which is autonomy support (Aelterman et al., 2019; Assor et al., 2002; Deci et al., 1981; Reeve, 2009).

Many recent literature reviews of autonomy-supportive teaching exist (Gustavsson et al., 2016; Lochbaum & Jean-Noel, 2016; Patall, 2019; Teixeira et al., 2020; Van den Berghe et al., 2014; Vasconcellos et al., 2020). These reviews collectively established a positive correlation between autonomy-supportive teaching and educationally-important student outcomes and, in doing so, have catalyzed the recent surge in classroom-based intervention research. These intervention studies have been designed to answer two key questions. First, can teachers learn how to become more autonomy supportive toward students? Second, if so, do acquired gains in autonomy-supportive teaching then cause subsequent gains in educationally-important outcomes?

The first question asks if autonomy-supportive teaching is malleable, or learnable through guidance. The second question asks whether acquired autonomy-supportive teaching is beneficial. The recent intervention research has answered these two questions and, in doing so, has raised additional questions about the nature of autonomy-supportive teaching and its potential to improve educational practice. Accordingly, the present paper aims to explain how this intervention research has advanced educators' understanding of the conceptualization, malleability, benefits, and potential of autonomy-supportive teaching. Here we explain what we mean by these four areas of advancement:

Conceptualization

What is the essence of autonomy-supportive teaching? What are its "active ingredients" that support students' motivation so well? How is autonomy-supportive teaching best defined—both conceptually and operationally?

Malleability

Can interventions be designed and implemented to provide teachers with the professional developmental experience they need to learn how to become more autonomy supportive? What professional-developmental resources do teachers acquire during a successful intervention experience that

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enables this professional development to occur? Once learned, does autonomy-supportive teaching endure?

Benefits

Do intervention-enabled gains in autonomy-supportive teaching increase teachers' causal capacity to produce important educational benefits? Who benefits from greater autonomy-supportive teaching—students? teachers? the classroom climate?

Potential to improve educational practice

Are there limiting conditions to the intervention effect, such as the teacher's personality or culture? Can autonomy-supportive teaching be used to increase the effectiveness of classroom structure, teacher involvement, and culturally responsive teaching? Can autonomy-supportive teaching be done poorly?

Conceptualization of autonomy-supportive teaching

The theoretical basis of autonomy-supportive teaching is self-determination theory (SDT; Ryan & Deci, 2017). SDT's central explanatory concept is the psychological need for autonomy, which is defined as the need for personal ownership over one's behavior. That is, autonomy is the psychological need to experience volition and self-endorsement in the initiation and regulation of one's behavior. When students become the origins of their own behaviors and pursuits and when students experience a wholehearted self-endorsement of what they are doing, they experience autonomy "satisfaction" in the form of pleasurable subjective feelings (e.g., enjoyment; Lee & Reeve, 2017). Once experienced, autonomy satisfaction enables gains in students' adaptive classroom functioning (e.g., engagement, learning) and psychological well-being.

Given the benefits of autonomy satisfaction, SDT researchers searched for the environmental conditions able to create the psychological experience of having one's autonomy supported. In one of these pioneering articles, Deci et al. (1994) used a laboratory procedure to experimentally manipulate the presence vs. absence of three interpersonal conditions—namely, provide explanatory rationales, acknowledge negative feelings, and rely on non-controlling language. What followed were many additional experimental manipulations of possible autonomy supports (e.g., choice; Assor et al., 2002). These experimental findings led to a list of individual autonomy supportive conditions that came to serve as the operational and conceptual definitions for autonomy support. One such well-accepted definition was as follows:

> The concept of autonomy support means that an individual in a position of authority (e.g., an instructor) takes the other's (e.g., a student's) perspective, acknowledges the other's feelings, and provides the other with pertinent information and opportunities for choice, while minimizing the use of pressures and demands. (Black & Deci, 2000, p. 742)

The tendency became to define autonomy support by reference to its behavioral markers.

A second well-accepted example was as follows:

> Autonomy support is clearly defined with respect to a behaviour set that an individual may exhibit that holds implications for the formation of self-determined regulations … , such as eliciting and acknowledging perspectives, supporting self-initiative, offering choice, providing relevant information, and minimizing pressure and control. (Rouse et al., 2011, p. 731)

Like others, the authors of the present article similarly defined autonomy support via its unique behavioral markers (Reeve, 2009, Table 1, p. 160). Defining autonomy support via "a behavior set," however, introduces three conceptual problems. First, such a definition does not identify the concept's essential nature. Second, it fails to identify the underlying source or origin of these behaviors. Third, it fails to explain why that particular teaching practice might be expected to produce its motivational effect. In the end, what was lacking was the identification of that which is responsible for the emergence of autonomy-supportive instructional behaviors in the first place.

Origins of autonomy-supportive teaching

The essence of autonomy-supportive teaching appears in Figure 1. Autonomy-supportive teaching is rooted in the teacher's *basic attitude* vis-à-vis students and in the teacher's *interpersonal tone* during teacher-student interactions. Specifically, autonomy-supportive teaching emerges out of a student-focused attitude and an understanding interpersonal tone. Together, a student focus and an understanding tone enable the teacher to take the students' perspective during instruction, which is the starting point to autonomy-supportive teaching.

Student-focused attitude

Basic attitude refers to how student- (rather than self-) focused the teacher is during the delivery of instruction (Vansteenkiste et al., 2019). Autonomy-supportive teachers adopt a curious, open, and flexible attitude toward students, as these teachers take an interest in students' emerging interests and preferences (Vansteenkiste et al., 2019). The student-focused attitude is to be curious about what students are thinking and wanting, open to students' input and engagement signals, and flexible and willing to bend the lesson to align more with students' preferences. In one study that illustrated that a student-focused attitude anticipated autonomy-supportive teaching, elementary-grade students were given pre-lesson expectancies of how student-focused vs. balanced-focused (the teacher was focused equally on students' and teachers' concerns) a new teacher was going to be, using the following experimental instructions (Gurland & Evangelista, 2015, p. 391):

> *Student-focused*: "Ms [Name] is really interested in kid's ideas, even more than her own ideas. She almost always lets kids do things their own way and asks kids first how they want to do things. She tries to help them do it the way they want to do it."

Balanced-focused: "Ms [Name] is sometimes interested in kid's ideas, but sometimes uses her own ideas without asking kids. She lets kids do some things their own way, but with other things, she says the kids have to do it her way. She makes sure they do it the way it is supposed to be done."

Children who interacted with the student-focused teacher, compared to children who interacted with the balanced-focused teacher, perceived their teacher to be more autonomy supportive. They also reported having a better rapport with the teacher, higher feelings of emotional security, and an overall higher-quality relationship with the teacher (i.e., more closeness, less conflict and dependency).

Understanding interpersonal tone

When making an engagement request (e.g., "participate in class") and when reacting to students' difficulties and problems, understanding teachers implicitly and explicitly let their students know that they care about how students are feeling, are paying attention to their concerns, are listening, are "on their side," are working to understand why students are fussing, and are willing to make instructional adjustments to better provide what students want and prefer (Reeve, 2016). By being understanding, the teacher avoids "me vs. my students" interactions that try to force students' compliance or obedience. Instead, the effort is to understand what students want, need, and prefer so that instruction can be provided accordingly. Importantly, understanding does not mean giving in to students but, instead, means working with students to help them successfully accomplish important classroom tasks. Teachers partly communicate their understanding through what they say, but they also communicate their understanding through vocal intonations and nonverbal gestures (Zougkou et al., 2017).

Together, a student-focused attitude and an interpersonal tone of understanding set the stage for, foreshadow, and enable the teacher's forthcoming autonomy-supportive instructional behaviors, as illustrated in Figure 1. Collectively, the seven instructional behaviors shown in the figure represent the day-to-day practice of autonomy-supportive teaching. These seven individual acts of autonomy-supportive teaching typically co-occur and are all positively intercorrelated (Cheon et al., 2018), presumably because they all share and emanate out of the same underlying source (basic attitude, interpersonal tone) and can be grouped by the two purposes they serve (i.e., support intrinsic motivation, support volitional internalizations). When these individual instructional behaviors co-occur, they coalesce into a single coherent *autonomy-supportive motivating style* (Reeve, 2009). It is this gestalt autonomy-supportive style (rather than the individual acts of instruction) that students perceive, respond to, and benefit from.

Autonomy-supportive teaching is the adoption of a student-focused attitude and an understanding interpersonal tone that enables the skillful enactment of seven autonomy-satisfying instructional behaviors to serve two purposes—support intrinsic motivation and support internalization. As illustrated in Figure 1, autonomy-supportive teaching begins with taking the students' perspective, which itself originates out of the teacher's student focus and understanding tone. Perspective taking both readies and then enables the teacher to support students' intrinsic motivation and internalizations. To support intrinsic motivation, teachers both encourage students to pursue their personal interests and present learning activities in need-satisfying ways. To support

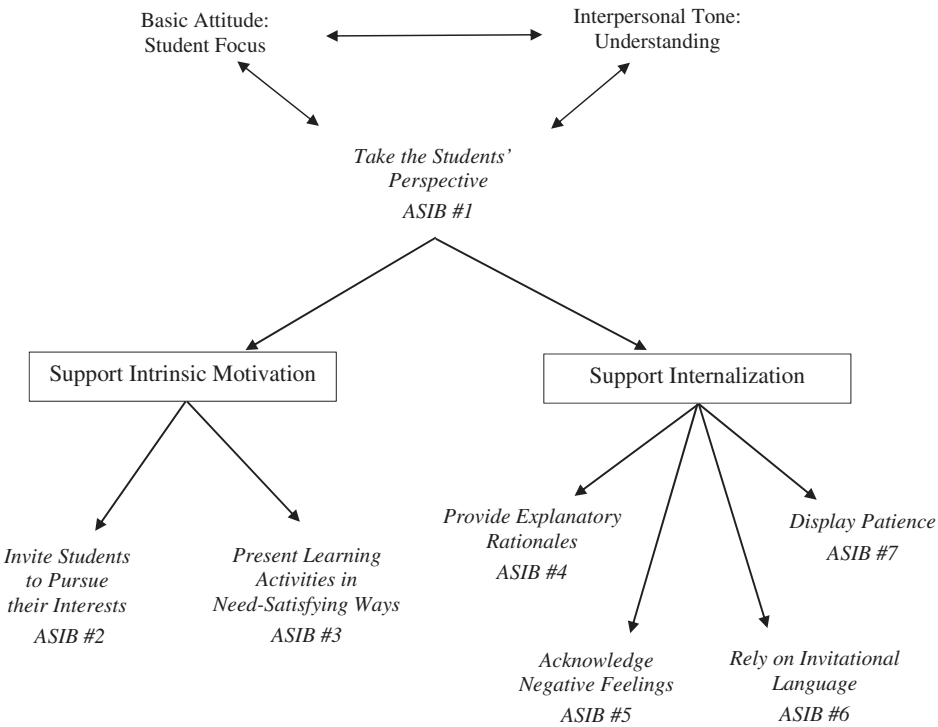

Figure 1. Seven autonomy-supportive instructional behaviors (in *italics*) organized by their origins (student-focused attitude, understanding interpersonal tone) and purposes (support intrinsic motivation, support internalization). ASIB: Autonomy-Supportive Instructional Behavior.

internalizations, autonomy-supportive teachers rely on a cluster of four interrelated acts of instruction that help students work through the internalization process of taking in and accepting external regulations as their own, including provide explanatory rationales, acknowledge and accept negative feelings, use invitational language, and display patience.

Autonomy-supportive instructional behaviors

The first autonomy-supportive instructional behavior (*ASIB #1* in Figure 1) is to take the students' perspective, which constitutes the "foundational activity" to autonomy-supportive teaching (Ryan & Deci, 2017, p. 443). Once the teacher has gathered the information needed to take the students' perspective and adopt their frame of reference, the teacher becomes well positioned to be responsive to and supportive of students' need for autonomy.

Take the students' perspective

Perspective taking is the active consideration of others' mental states and subjective experiences (Todd & Galinsky, 2014). In the case of instruction, perspective taking is the teacher seeing and experiencing classroom events as if he or she were the students (rather than the teacher). To prepare for perspective taking, the teacher first needs to de-prioritize his or her own perspective to attend more to the students' perspective and concerns (i.e., adopt a student-focused attitude). By doing so, the teacher becomes both more willing (because of greater empathy) and more able (because of greater perspective taking) to create classroom conditions to support students' autonomy. To then actually take the students' perspective, the teacher conducts formal and informal formative assessments to understand what students are thinking and wanting. Formally, the teacher may conduct structured formative assessments, such as "teach in students' preferred ways" (Jang et al., 2016) or "exit slips" in which students take the last 2–3 minutes of class to submit (via computer or sticky notes) their reactions to the day's lesson and suggestions for future instruction. Informally (i.e., conversationally), the teacher may ask questions as to what students think of (and feel about) the learning material, solicit their input on the lesson, listen carefully to what students want and prefer, invite question-asking, create opportunities for students to express their preferences, and initiate teacher-student dialogues to appreciate students' concerns (Kaplan & Assor, 2012; Patall et al., 2013, 2018). Teachers can conduct such formative assessments before the lesson, in the first moment of instruction, during the lesson, and at the end of the lesson. If the teacher prepares or delivers the lesson without taking the students' perspective, the odds increase dramatically that students' need for autonomy will be either neglected or frustrated.

Support intrinsic motivation

Intrinsic motivation is the motivation to engage in an activity out of interest and enjoyment. It is the inherent desire to seek out novelty and challenges, to explore new environments, to take interest in activities and new adventures, and to stretch and extend one's abilities (Ryan & Deci, 2017). It is a naturally-occurring motivation toward exploration, spontaneous interest, activity engagement, and environmental mastery. A key source of intrinsic motivation is the need for autonomy, so to support students' intrinsic motivation teachers can support students' autonomy. Teachers may do this in two primary ways—invite students to pursue their personal interests (*ASIB #2*) and present learning activities in need-satisfying ways (*ASIB #3*).

Interest is a powerful source of motivation (Renninger & Hidi, 2016), including autonomy satisfaction (Tsai et al., 2008). *Invite students to pursue their personal interests* is a highly autonomy-supportive act of instruction, because interesting activities are themselves autonomy supports. The role that the teacher can play in this process is to provide students with interesting activities, introduce a learning activity and ask students what they find to be most interesting about that activity, suggest where students might find interesting things to explore and engage, and invite students to pursue their personal interests. When teachers invite students to pursue their personal interests, students tend to (1) feel like origins (rather than pawns), (2) feel that their behavior is self-authored, (3) experience volition, (4) experience a sense of ownership over their behavior, and (5) engage in lessons with an authentic sense of wanting to do them (i.e., with interest and intrinsic motivation; Jang et al., 2016; Patall et al., 2013; Patall et al., 2017; Vansteenkiste et al., 2004; Wallace et al., 2014).

To support students' intrinsic motivation teacher may also *present learning activities in need-satisfying ways*. The primary way that teachers can present a learning activity in an autonomy-satisfying way is to offer choice (Katz & Assor, 2007; Patall, 2013; Patall et al., 2013). With choice, the teacher allows students to decide for themselves to engage in one activity rather than another, in one course of action rather than another, or to put themselves in one situation rather than another. The reason why choice is a pathway to autonomy satisfaction is because, to make a choice, students first need to look inside themselves to consider their interests, goals, priorities, and preferences. When students' behaviors and decision-making are guided by their interests, goals, and so forth, then students have the sense that their behaviors and decisions originate from within themselves. When choice allows students to pursue their interests and personal goals, then "offer choice" becomes an instructional pathway to autonomy satisfaction (Patall et al., 2013, 2018; Waterschoot et al., 2019). That said, there is considerable teaching skill involved in offering autonomy-satisfying choices. Before choice can be expected to translate into autonomy satisfaction, it needs to be accompanied by the presence of additional autonomy-supportive acts of instruction (e.g., take the students' perspective), it needs to be meaningful (i.e., an authentic opportunity to explore an interest, pursue a personal goal, or express an identity), and students need to feel competent and informed enough to make that choice (Patall et al., 2021).

Support internalization

Internalization is the process of taking in values, beliefs, and behavioral regulations from societal sources (e.g., teachers) and transforming them into one's own (Ryan & Deci, 2000). It is an experience of discovering the value and personal utility within an activity or way of behaving. Teachers often consider facilitating students' internalization to be among their most difficult teaching challenges (Vasconcellos et al., 2020), and this is largely because teachers are in the position of asking student to do what they view as uninteresting, not worth the effort, or even a source of negative feelings. Teachers can help students work through the internalization process by providing four autonomy supports—provide explanatory rationales (*ASIB #4*), acknowledge negative feelings (*ASIB #5*), rely on invitational language (*ASIB #6*), and display patience (*ASIB #7*).

In the course of instruction, teachers often ask students to do things that students may perceive to be uninteresting and unimportant (e.g., follow safety procedures, double-check their work). When students do not understand or appreciate why the teacher is making a request of them, they tend to view the request as arbitrary or as meaningless busywork. To *provide explanatory rationales*, the teacher reveals the "hidden value" and "personal relevance" within the request (Vansteenkiste et al., 2018). A rationale is a verbal explanation as to why putting forth effort during the activity might be personally useful (Reeve et al., 2002). It is often communicated with a phrase such as, "Doing this activity has been shown to be useful" (Deci et al., 1994, p. 127), with the teacher then proceeding to explain that personal utility. Because most students value greater skill, better performance, deeper friendships, and an improved classroom community, teachers can often explain that an activity is worth doing because it fulfills one of these four purposes (Vansteenkiste et al., 2004, 2005). As explained by the situated expectancy value theory (SEVT; Wigfield & Eccles, 2020), explaining utility value helps students develop an initial sense of value and personal relevance for that task. What self-determination theory adds to the SEVT framework is the proposition that rationales rooted in and aligned with the students' (rather than with the teacher's) perspective work best in terms of supporting the internalization process (Jang, 2008; Savard et al., 2013).

Students sometimes complain, resist, and express negative feelings about having to engage in uninteresting or difficult tasks. When these experiences of anxiety, confusion, frustration, anger, resentment, boredom, and stress arise, they can overwhelm students' volitional motivation. Dissipating these negative feelings therefore becomes a prerequisite to motivationally readying students to engage in, benefit from, and eventually internalize the value of the lesson, and teachers can do this when they *acknowledge and accept negative feelings*. To do so, the teacher first acknowledges that his or her request may conflict with and be at odds with the students' preferences (e.g., "I see that you are not very enthusiastic about today's lesson."), and second accepts the negative feelings as a potentially valid and legitimate reaction, at least from the students' point of view (e.g., "Yes, you are right; we have practiced this same skill many times before, haven't we?"). By acknowledging and accepting the negative feelings, the teacher gains an internalization-enabling opportunity to work collaboratively with the students to dissipate the negative feelings and transform or restructure the activity into something the students volitionally want to do (e.g., "Okay, so what might we do differently so that you won't feel this way?").

When teachers make an engagement request and when teachers address students' problematic behavior (e.g., behavioral misconduct, poor performance), both the content and tone of the teacher's language are important. Anticipating resistance and counter-arguments, teachers often resort to preemptive pressuring language and prosody laced with autonomy-suppressive compliance hooks (i.e., "you must," "you have to") that are meant to change the student's behavior in a teacher-prescribed way (Assor et al., 2005; Noels et al., 1999). Contrariwise, when teachers *rely on invitational language*, they encourage student initiative and behavior change by relying on volition-rich language (i.e., "You might want to …," "You might consider …"; Vansteenkiste et al., 2005) paired with understanding voice prosody (i.e., higher pitch, slower speech rate, milder voice quality; Zougkou et al., 2017). Through invitational language, the teacher helps students overcome problems of inertia (e.g., passivity, procrastination). Invitational language also includes non-controlling informational language (Su & Reeve, 2011). With informational language, the teacher asks the student if he or she perceives that a problem exist (e.g., "Do you think it is okay to talk to your classmates like that?"), what its underlying cause might be ("Why do you think that happened?"), and may add new information to help the student better diagnose, understand, and solve the problem he or she faces. The idea is to address the problem while preserving the student's ownership over the behavior change and personal agency for solving the problem.

Patience is the optimistic calmness a teacher shows as students struggle to start, adjust, and change their behavior. *Display patience* means giving students the time and space they need to work at their own pace and in their own way, and allowing students' thinking, answers, behaviors, performances, and internalization attempts to exist in an unfinished state. Of course, circumstances make it easy to understand why teachers are sometimes not patient (e.g., time constraints, high-stakes testing, cultural norms), but the reason to be patient (motivationally speaking) comes from a deep valuing of the student's autonomy and an understanding that meaningful gains in cognitive engagement (e.g., elaborating, paraphrasing, critical thinking), conceptual learning (e.g., conceptual change, cognitive accommodation, deep information processing), and behavior change all take time and require multiple iterations and revisions. While being patient, the teacher nevertheless awaits a student-generated signal that the teacher's help and guidance would be appreciated (Reeve & Jang, 2006). In contrast, teacher impatience would be intruding on students' preferred pace of learning, usually by pushing and pressuring for a faster pace, as by uttering verbal (e.g., "hurry up") and

non-verbal (e.g., clap, clap the hands) communications (Assor et al., 2005). When impatient, teachers bring students' thinking or working to a quick close by showing or telling the right answer or desired behavior (e.g., "Here, let me do this for you.").

Controlling teaching

Controlling teaching is the adoption of a teacher-focused authoritarian attitude and an interpersonal tone of pressure in which the teacher prescribes what students are to think, feel, and do, irrespective of what students prefer (Aelterman et al., 2019; Reeve, 2009; Soenens et al., 2012). In practice, when controlling, teachers first prescribe what students should think, feel, and do, and then second, apply an increasing amount of pressure until students forgo their own needs, interests, preferences, and goals to instead think, feel, and do as they are told.

Controlling instructional behaviors include those that are both externally controlling (i.e., behavioral control) and internally controlling (i.e., psychological control) (Soenens & Vansteenkiste, 2010). Behavioral control is the teacher's effort to gain control over students' behaviors, as exemplified by pressuring-inducing tactics such as yelling, scolding, intimidating, commanding, bribing (i.e., offering contingent rewards, including token economies and point systems), and various intrusive and manipulative socialization practices, such as punishing and denying rights (Assor et al., 2005). Psychological control is the teacher's effort to gain control over students' thoughts and feelings so that students will pressure and coerce themselves into performing teacher-prescribed behaviors, as exemplified by various manifestations of positive conditional regard (i.e., giving attention and love following compliance), negative conditional regard (withdrawing attention and love following noncompliance), personal attacks of the student's sense of self, expressions of disappointment, guilt inductions, and shaming (Kaplan, 2018; Roth et al., 2009; Soenens & Vansteenkiste, 2010).

In the paper that introduced autonomy-supportive teaching, motivating style was conceptualized along a bipolar continuum that ranged from a highly autonomy-supportive style on one end to highly controlling style on the other (Deci et al., 1981). The contemporary thinking, however, is that these aspects of motivating style exist as two separate dimensions (Bartholomew et al., 2011, 2018; Haerens et al., 2015). Treating autonomy support and teacher control as largely independent (rather than opposite) dimensions is justified by the following four findings: (1) the two styles are only modestly negatively correlated; (2) a low level in one style does not imply a high level in the other; (3) autonomy support strongly predicts high autonomy satisfaction and adaptive functioning but only weakly predicts low autonomy frustration and maladaptive functioning; and (4) teacher control strongly predicts high autonomy frustration and maladaptive functioning but only weakly predicts low autonomy satisfaction and adaptive functioning (Bartholomew et al., 2011, 2018; Cheon et al., 2016; De Meyer et al., 2014; Gunnell et al., 2013; Haerens et al., 2015).

Theoretically, what this means is that self-determination theorists now endorse the "dual-process model" in which autonomy-supportive teaching galvanizes the "brighter" side of students' motivation (e.g., autonomy satisfaction) and functioning (e.g., engagement), while controlling teaching galvanizes the "darker" side of students' motivation (e.g., autonomy frustration) and functioning (e.g., antisocial behavior) (Bartholomew et al., 2011, 2018; Haerens et al., 2015; Jang et al., 2016; Vansteenkiste & Ryan, 2013). Practically, what this means is that the effort to become more autonomy supportive requires skill development in two areas: (1) how to enact ASIBs; and (2) how to transform existing controlling instructional behaviors into replacement ASIBs (e.g., replace utter directives with provide explanatory rationales; replace pressuring language with invitational language).

Malleability of autonomy-supportive teaching

During the delivery of their instruction, teachers vary in how autonomy supportive they are. Correlational research shows that the more autonomy supportive teachers are, the more positive students' classroom experiences tend to be (Aelterman et al., 2019). Recognizing this, researchers developed SDT-based professional developmental experiences to help teachers learn how to become more autonomy supportive. The question driving these teacher-focused interventions was whether or not autonomy-supportive teaching was malleable—that is, learnable through modeling, guidance, practice, and feedback.

Though different researchers offered different professional developmental experiences, the most common methodology was to deliver the intervention experience in three parts. Part 1 has generally been information-based. Part 1 introduces autonomy-supportive teaching, provides empirical evidence of its benefits, and introduces recommended autonomy-supportive instructional behaviors. Part 2 has generally been skill-based. Part 2 offers teacher-participants the modeling, mentoring, training, and practice they need to enact autonomy-supportive instructional behaviors in their own classrooms with their own students. Part 3 has generally been a blend of group discussion and opportunities for personal reflection. Part 3 helps teachers work through the professional development processes of conceptual change, skill refinement, and integrating the individually-recommended acts of instruction into a coherent autonomy-supportive motivating style.

Almost all of these intervention studies utilized an experimental research design in which a sample of teachers was randomly assigned into either an intervention-based experimental group or a no-intervention ("practice as usual") control group. To evaluate whether teachers in the experimental group became significantly more autonomy supportive, researchers assessed autonomy-supportive teaching through students' perceptions, classroom observers' objective ratings, or teachers' self-report.[1]

[1]To measure autonomy-supportive teaching, researchers use one or more of the following assessments: (1) students' perceived autonomy-supportive

Table 1 lists 51 autonomy-supportive teaching intervention empirical studies. These articles were located through an exhaustive search of electronic databases (e.g., Psyarticles, PsychINFO, ISI Web of Science, Medline), manual searches of key journals, and the reference lists of SDT-based review articles and of the found articles themselves, conducted during October 2020. Search terms used were "autonomy support" OR "autonomy supportive" OR "autonomy-supportive" AND "intervention" OR "RCT" OR "randomized control trial" OR "training" OR "workshop." Studies were included if they presented a step-by-step plan to manipulate autonomy-supportive teaching (e.g., an intervention and not just an experimental manipulation) and provided a statistical test as to whether or not the intervention effect occurred (e.g., a manipulation check).

The 51 intervention studies were divided into those 38 that featured an appropriate control group (a randomized control trial) and teachers as participants, as shown in the upper part of the table, and those 13 additional investigations that did not feature a randomized control trial design (usually a single-group pretest-posttest research design) or teacher participants (usually coaches). The columns in Table 1 provide information on the research design utilized, the nature of the intervention (its phases and duration), the participants, and whether or not the intervention was effective. The "Was the Intervention Effective?" column displays both whether the statistical test of the intervention effect was statistically significant (yes or no) and its observed effect size (expressed in terms of Cohen's *d* statistic). The rightmost column provides information of the intervention's observed benefits, which will be discussed in the "Benefits" section.

The 38 experimental interventions produced a high success rate showing that autonomy-supportive teaching was malleable. Thirty-seven of these 38 investigations included a student-based manipulation check. In these studies, the intervention's success rate was 95% (35 "yes," 2 "no"). Twenty-one of these 38 investigations included a rater-scored manipulation check. In these studies, the intervention's success rate was 100% (21 "yes," 0 "no"). Too few studies included a teacher-reported manipulation check to provide a meaningful interpretation. (An analysis of the 13 additional interventions in the lower part of the table produced similar statistics.)

In general, the observed effect sizes were universally large [according to Cohen's (1988) criteria in which a *d* of 0.10 corresponds to a small effect, 0.35 corresponds to a moderate effect, and 0.50 corresponds to a large effect]. Interestingly, the effects sizes for the rater-scored measures were consistently larger than those for the student-perceived measures. Several studies also included a manipulation check to test whether or not the intervention decreased controlling teaching. Across these 21 manipulation checks (14 that used students' perceptions, 7 that used raters' scores), the intervention's success rate was 100%. Collectively, these findings suggest that autonomy-supportive teaching is malleable (i.e., something that can be learned through modeling, guidance, and deliberate practice).

Once learned, does autonomy-supportive teaching endure?

During any autonomy-supportive intervention, teachers receive significant support from the research team. So, it would be understandable if teachers who became highly autonomy supportive during the intervention reverted back to their pre-intervention motivating style in the absence of the intervention's formal support system. After all, all of the following commonplace teaching circumstances tend to push teachers away from autonomy-supportive teaching: accountability pressure to produce high test scores (Deci et al., 1982; Flink et al., 1990); pressure to teach to the test (Sun et al., 2013); high-stakes testing (Ryan & Brown, 2005); time constraints, summative grading, and administrative pressure to adopt prescribed teaching methods (Pelletier & Sharp, 2009; Taylor et al., 2009); work overload (Bartholomew et al., 2014); years of teaching experience (Reeve et al., 2018); and students who appear to be unmotivated, disengaged, or behaviorally disruptive (Fernet et al., 2012; Jang et al., 2016; Pelletier et al., 2002).

Only two empirical studies have addressed this question of the durability of the intervention effect over time. Both investigations revisited teachers who had participated in an intervention either one-year (Cheon & Reeve, 2013) or 15-months (Tilga et al., 2020) earlier to see if they were still utilizing autonomy-supportive teaching in their new classes with their new students. Both follow-up studies showed that autonomy-supportive teaching, once learned during the earlier professional developmental experience, endured. Though more research needs to be conducted on the long-term staying power of acquired autonomy-supportive teaching, the research conducted to date suggests that intervention-enabled autonomy-supportive teaching does endure for at least one year.

Why is autonomy-supportive teaching malleable?

Autonomy-supportive interventions are designed to provide teachers with a professional developmental opportunity to upgrade the quality of their classroom motivating style. A few intervention studies have looked inside this professional developmental process to ask what personal-professional resources teachers develop during a successful intervention experience that allows them to become more autonomy supportive (Aelterman et al., 2013; Cheon et al., 2018; Reeve & Cheon, 2016).

teaching (e.g., Learning Climate Questionnaire; Williams & Deci, 1996); (2) trained raters' objective scoring of teachers' in-class usage of ASIBs (e.g., Behavior Rating Scale; Cheon et al., 2018); and (3) teachers' self-reported autonomy-supportive teaching (e.g., Situations in Schools questionnaire, Aelterman et al., 2019; Teaching Scenarios measure, Reeve & Cheon, 2016). To measure controlling teaching, researchers use one or more of the following assessment procedures: (1) students' perceived controlling teaching (e.g., Psychologically Controlling Teaching questionnaire, Soenens et al., 2012; Controlling Teacher Questionnaire; Jang et al., 2009); (2) trained raters' objective scoring of teachers' in-class usage of controlling behaviors (e.g., Behavior Rating Scale; Cheon et al., 2018); and (3) teachers' self-reported controlling teaching (e.g., Situations in Schools questionnaire, Aelterman et al., 2019; Teaching Scenarios measure, Reeve & Cheon, 2016).

Table 1. Autonomy-supportive teaching interventions: 38 experimental (and 13 additional) interventions that tested for effectiveness and benefits.

Reference citation	Research design	Phases & duration of training	Participants & nation (sample)	Was the intervention effective?	Student and teacher benefits enabled by the intervention
38 Experimental (RCT) Interventions					
Abula et al., 2020 (Study 2)	RCT, Pretest-Posttest	3 Sessions, 8 Hours + Follow-up, 16 Weeks	10 Chinese PE Teachers & their 258 University Students	Yes, AS increased: Students: $d = 0.79$	Students Increased: • Autonomous Motivation
Aelterman et al., 2014	RCT, Pretest-Posttest	3 Sessions, 6 Hours, 1 Day	39 Belgian PE Teachers & their 669 Middle & High School Students	Yes, AS increased: Students: $d = 0.34$ Raters: $d = 0.88$	Teachers Increased: • Positive Beliefs about Autonomy-Supportive Teaching
Assor et al., 2018	Quasi-Experimental, Pretest-Posttest	44 Sessions, Twice Monthly, 22 Months	24 Israeli Elementary Teachers & their 1,007 3rd through 6th Grade Students	No, AS unchanged: Students: $d = 0.15$ Yes, TC decreased: Students: $d = 0.61$	Students Increased: • Caring Students Decreased: • Physical Violence
Barkoukis, et al., 2020	Experimental, Pretest-Posttest	20 Sessions, Twice Weekly for 10 Weeks	2 Greek PE Teachers & their 256 Middle School Students	Yes, AS increased: Students: $d = 1.06$	Students Increased: • Autonomous Motivation
Chatzisarantis & Hagger, 2009	Experimental, Longitudinal	3 Sessions, 9 Hours, 5 Weeks	10 UK PE Teachers & their 215 Middle School Students	Yes, AS increased: Students: $d = 1.23$	Students Increased: • Autonomous Motivation • Physical Activity Level
Cheon & Reeve, 2013	RCT, Longitudinal	3 Sessions, 8 Hours, 13 Weeks	17 Korean PE Teachers & their 953 Middle & High School Students	Yes, AS increased: Students: $d = 0.44$ Raters: $d = 1.43$ Yes, TC decreased: Students: $d = 0.58$	Students Increased: • Need Satisfaction • Autonomous Motivation • Engagement • Perceived Skill Develop. • Future Intentions • Expected Course Grade Students Decreased: • Amotivation
Cheon & Reeve, 2015	RCT, Longitudinal	3 Sessions, 8 Hours, 8 Weeks	16 Korean PE Teachers & their 598 Middle & High School Students	Yes, AS increased: Students: $d = 0.70$ Raters: $d = 2.79$ Yes, TC decreased: Students: $d = 0.33$	Students Increased: • Need Satisfaction • Engagement Students Decreased: • Amotivation
Cheon et al., 2018	RCT, Longitudinal	3 Sessions, 6 Hours + Follow-up, 18 Weeks	91 Korean 4th through 12th Grade PE Teachers	Yes, AS increased: Teachers: $d = 0.69$	Teachers Increased: • Need Satisfaction • Teaching Efficacy • Intrinsic Instructional Goals
Cheon et al., 2019	RCT, Longitudinal	3 Sessions, 8 Hours, 6 Weeks	37 Korean PE Teachers & their 2,669 Middle & High School Students	Yes, AS increased: Students: $d = 2.92$ Raters: $d = 1.49$ Yes, TC decreased: Students: $d = 1.91$	Students Increased: • Need Satisfaction • Autonomous Motivation • Engagement • Perceived Skill Develop. • Future Intentions • Expected Course Grade Students Decreased: • Amotivation

(*continued*)

Table 1. Continued.

Reference citation	Research design	Phases & duration of training	Participants & nation (sample)	Was the intervention effective?	Student and teacher benefits enabled by the intervention
Cheon et al., 2021a	RCT, Longitudinal	3 Sessions, 8 Hours, 8 Weeks	49 Korean PE Teachers & their 1,487 Middle & High School Students	Yes, AS increased: Students: $d = 0.91$ Raters: $d = 3.03$ Yes, TC decreased: Students: $d = 1.42$ Raters: $d = 2.29$	Students Increased: • Need Satisfaction • Supportive Class Climate • Prosocial Behavior Students Decreased: • Need Frustration • Conflictual Class Climate • Antisocial Behavior
Cheon et al., 2021b	RCT, Longitudinal	3 Sessions, 8 Hours, 8 Weeks	41 Korean PE Teachers in 82 Classrooms & their 2,272 Middle & High School Students	Yes, AS increased: Students: $d = 2.69$ Yes, TC decreased: Students: $d = 1.54$	Students Increased: • Need Satisfaction • Supportive Class Climate • Positive Self-Concept • Prosocial Behavior Students Decreased: • Need Frustration • Conflictual Class Climate • Self-Reported Bullying • Teacher-Rated Bullying
Cheon et al., 2012	RCT, Longitudinal	3 Sessions, 9 Hours, 13 Weeks	21 Korean PE Teachers & their 1,158 Middle & High School Students	Yes, AS increased: Students: $d = 0.41$ Raters: $d = 2.26$ Yes, TC decreased: Students: $d = 0.27$ Raters: $d = 1.49$	Students Increased: • Need Satisfaction • Autonomous Motivation • Engagement • Perceived Skill Develop. • Future Intentions • Expected Course Grade Students Decreased: • Amotivation
Cheon et al., 2018	RCT, Longitudinal	3 Sessions, 8 Hours, 8 Weeks	33 Korean PE Teachers & their 1,824 Middle & High School Students	Yes, AS increased: Students: $d = 0.99$ Raters: $d = 2.26$ Yes, TC decreased: Students: $d = 0.64$ Raters: $d = 1.27$	Students Increased: • Need Satisfaction • Prosocial Behavior Students Decreased: • Need Frustration • Antisocial Behavior • Accept Cheating
Cheon, Reeve, & Ntoumanis, 2019	RCT, Longitudinal	3 Sessions, 8 Hours, 8 Weeks	42 Korean PE Teachers & their 2,739 Middle & High School Students	Yes, AS increased: Students: $d = 1.25$ Raters: $d = 2.49$ Yes, TC decreased: Students: $d = 0.63$ Raters: $d = 1.43$	Students Increased: • Need Satisfaction • Expect Course Grade • Perceived Skill Dev. • Task-Involving Classroom Climate • Prosocial Behavior Students Decreased: • Need Frustration • Ego-Involving Classroom Climate • Antisocial Behavior
Cheon et al., 2016	RCT, Longitudinal	3 Sessions, 8 Hours, 12 Weeks	19 Korean PE Teachers & their 1,017 Middle & High School Students	Yes, AS increased: Students: $d = 0.47$ Raters: $d = 1.88$ Yes, TC decreased: Students: $d = 0.63$	Students Increased: • Need Satisfaction • Engagement Students Decreased: • Need Frustration • Amotivation

(*continued*)

Table 1. Continued.

Reference citation	Research design	Phases & duration of training	Participants & nation (sample)	Was the intervention effective?	Student and teacher benefits enabled by the intervention
Cheon, Reeve, & Song, 2019	RCT, Longitudinal	3 Sessions, 8 Hours, 7 Weeks	32 Korean PE Teachers & their 2,131 Middle & High School Students	Yes, AS increased: Students: $d = 0.67$ Yes, TC decreased: Students: $d = 0.32$	Students Increased: • Need Satisfaction • Intrinsic Goals • Perceived Skill Develop. • Self-Concept Students Decreased: • Need Frustration • Problematic Relations
Cheon et al., 2020 (Study 1)	RCT, Longitudinal	3 Sessions, 8 Hours, 7 Weeks	33 Korean PE Teachers & their 1,824 Elementary, Middle, & High School Students	Yes, AS increased: Students: $d = 1.29$ Teachers, $d = 2.00$	Teachers Increased: • Teaching Efficacy • Intrinsic Instructional Goals • Job Satisfaction • Harmonious Passion • Relationship Satisfaction with Students
Cheon et al., 2020 (Study 2)	RCT, Longitudinal	3 Sessions, 8 Hours, 7 Weeks	46 Korean PE Teachers & their 3,123 Middle & High School Students	Yes, AS increased: Students: $d = 0.90$ Raters: $d = 1.68$	Students Increased: • Need Satisfaction • Engagement • Perceived Skill Develop. • Intentions to Continue • Anticipated Course Grade
Cheon et al., 2014	RCT, Longitudinal	3 Sessions, 8 Hours, 12 Weeks	27 Korean PE Teachers & their 1,229 Elementary, Middle & High School Students	Yes, AS increased: Students: $d = 0.45$ Raters: $d = 1.98$ Yes, TC decreased: Students: $d = 0.42$	Students Increased: • Need Satisfaction Students Decreased: • Need Frustration Teachers Increased: • Need Satisfaction • Autonomous Motivation • Teaching Efficacy • Intrinsic Instructional Goals • Job Satisfaction • Vitality Teachers Decreased: • Emotional Exhaustion
deCharms, 1972, 1976	RCT, Longitudinal	4 Sessions, 12 Hours, 6 Weeks	60 USA Teachers & their 7th & 8th Grade Students	Yes, AS increased: Students: $d = 0.55$ Raters: $d = 0.88$	Students Increased: • Origin Motivation • Academic Achievement
Escriva-Boulley et al., 2018	RCT, Longitudinal	4 Sessions, 12 Hours + Follow-up, 1 Year	15 French PE Teachers & their 293 Elementary School Students	Yes, AS increased: Students: $d = 0.73$	Students Increased: • Physical Activity Level
Fin et al., 2019	Experimental, Pretest-Posttest	40 Hours of Training	2 Brazilian Teachers & their 61 Middle School Students	Yes, AS increased: Students: $d = 0.62$ Raters: 94% Yes, TC decreased: Students: $d = 0.83$ Raters: 2%	Students Increased: • Need Satisfaction • Autonomous Motivation Students Decreased: • Controlled Motivation
Flunger et al., 2019	Experimental, Cross-Sectional	1 Session, 1 Hour + Follow-up	17 German Physics Teachers & their 345 9th Grade Students	Yes, AS increased: Students: $d = 0.53$ Raters: $d = 5.89$	Students Increased: • Need Satisfaction • Positive Emotions • Self-Regulated Learning Students Decreased: • Negative Emotions

(*continued*)

Table 1. Continued.

Reference citation	Research design	Phases & duration of training	Participants & nation (sample)	Was the intervention effective?	Student and teacher benefits enabled by the intervention
Huescar et al., 2019	Quasi-Experimental, Pretest-Posttest	60 Sessions, 20 Hours, 20 Weeks	2 Spanish PE Teachers & their 62 5th & 6th Grade Students	Yes, AS increased: Students: $d = 0.98$ Yes, TC decreased: Students: $d = 1.65$	Students Increased: • Need Satisfaction • Physical Activity Level Students Decreased: • External Regulation
Lonsdale et al., 2013	RCT, Pretest-Posttest	1 Session, 20 Minutes	16 Australian PE Teachers & their 288 Middle School Students	Yes, AS increased: Students: $d = 0.72$ Raters: $d = 2.07$	Students Increased: • Physical Activity Level Students Decreased: • Sedentary Level
McLachlan & Hagger, 2010	Experimental, 3-wave Prospective	2 20-minute Training Sessions	9 University Tutors in the United Kingdom	Yes, AS increased: Students: $d = 1.73$ Raters: Various	
Manninen et al., 2020	Experimental, Cross-sectional	Not enough information	1 USA PE Teacher & his 59 University Students	Yes, AS increased: Students: $d = 0.71$ Raters: $d = 2.75$	Students Increased: • Intrinsic Motivation • Skilled Performance
Meng & Wang, 2016	Experimental, Pretest-Posttest	3 Sessions, 8 Hours, 1 Week	8 Singaporean PE Teachers & their 648 Middle & High School Students	Yes, AS increased: Students: $d = 0.23$	Students Increased: • Need Satisfaction • Autonomous Motivation • Engagement • Physical Activity Level
Niemiec & Muñoz, 2019	Experimental, Cross-sectional	3 Sessions, 10.5 Hours, 3 Weeks	14 Columbian Teachers & their 167 Elementary, Middle, & High School Students	Yes, AS increased: Students: $d = 0.32$	Students Increased: • Need Satisfaction • Autonomous Motivation
Perlman, 2011, 2015	Experimental, Pretest-Posttest	Online Delivery, 2 Weeks	28 USA Preservice Teachers & their 659 9th Grade Students	Yes, AS increased: Students: $d = 0.41$ Raters: $d = 1.09$ No, AS unchanged: Teachers: $d = 0.18$ Yes, TC decreased: Raters: $d = 0.79$	
Reeve & Cheon, 2016	RCT, Pretest-Posttest	3 Sessions, 8 Hours, 12 Weeks	42 Korean PE Teachers & their 2,380 Middle & High School Students	Yes, AS increased: Students: $d = 1.52$ Teachers: $d = 1.08$ Yes, TC decreased: Students: $d = 0.63$	Teachers Increased: • Positive Beliefs about Autonomy-Supportive Teaching • Future Intentions
Reeve et al., 2020	RCT, Longitudinal	3 Sessions, 8 Hours, 7 Weeks	33 Korean PE Teachers & their 1,422 Middle & High School Students	Yes, AS increased: Students: $d = 0.43$	Students Increased: • Need Satisfaction • Agentic Engagement Students Decreased: • Need Dissatisfaction • Agentic Disengagement
Reeve et al., 2004	RCT, Pretest-Posttest	1 Session, 1 Hour + Follow-up, 4 Weeks	20 USA Teachers & their 480 High School Students	Yes, AS increased: Raters: $d = 1.94$	Students Increased: • Engagement
Sanchez-Oliva et al., 2017	RCT, Longitudinal	3 Sessions, 15 Hours, 4 Weeks	21 Spanish PE Teachers & their 836 Middle School Students	Yes, AS increased: Students: $d = 0.42$	Students Increased: • Autonomous Motivation

(*continued*)

Table 1. Continued.

Reference citation	Research design	Phases & duration of training	Participants & nation (sample)	Was the intervention effective?	Student and teacher benefits enabled by the intervention
Schneider et al., 2020	RCT, Longitudinal	6 Sessions, 12 Hours	29 Finnish PE Teachers & their 370 Middle School Students	Yes, AS increased: Students: $d = 0.18$ No, AS unchanged: Teachers: $d = 0.42$ No, TC unchanged: Teachers: $d = 0.49$	
Tilga et al., 2019	RCT, Pretest-Posttest	Online Delivery, 4 Hours, 4 Weeks	28 Estonian PE Teachers & their 190 Middle School Students	Yes, AS increased: Students: various Yes, TC decreased: Students: Various	Students Increased: • Need Satisfaction • Intrinsic Motivation Students Decreased: • Need Frustration
Ulstad et al., 2018	RCT, Pretest-Posttest	3 Sessions, 8 Hours, 12 Weeks	18 Norwegian Teachers & their 390 8th Grade Students	Yes, AS increased: Students: $d = 0.23$	Students Increased: • Absorption • Effort Regulation • Self-Reported Course Grade
Zhang et al., 2020	Quasi-Experimental, Longitudinal	3 Sessions, 6 Hours, 1 Week	1 Chinese Physics Teacher and her 4 classes of 107 8th Grade Students	No, AS unchanged: Students: $d = 0.27$ Yes, AS increased: Raters: various	Students Increased: • Need Satisfaction
13 Additional Interventions					
Aelterman et al., 2013	Professional Development Training	3 Sessions, 3 Hours, 1 Day	35 Belgian Middle & High School PE Teachers	Yes, Teachers Valued the AS Training, Found It Useful, and Intended to Implement It	Teachers Increased: • Psychological Needs
Aelterman et al., 2016	Single Group, Pretest-Posttest	3 Sessions, 6 Hours, 1 Day	80 Belgian Middle & High School PE Teachers	Yes, AS increased: Teachers: $d = 0.37$	Teachers Increased: • Positive Beliefs about Autonomy-Supportive Teaching
Cheon et al., 2015	RCT, Longitudinal	3 Sessions, 6 Hours + One-on-one Follow-up, 7 Weeks	33 Korean Paralympic Coaches & their 64 Adult Athletes	Yes, AS increased: Athletes: $d = 0.87$ Raters: $d = 1.47$ Yes, TC decreased: Athletes: $d = 0.98$	Athletes Increased: • Self-Reported Engagement • Coach-Rated Engagement • Olympic Medals Won Coaches Increased: • Need Satisfaction • Job Satisfaction
Edmunds et al., 2008	Quasi-Experimental, Longitudinal	Not enough information	2 UK Exercise Instructors & their 61 University Students	Yes, AS increased: Students: $d = 0.87$ Raters: $d = 0.61$	Students Increased: • Psychological Needs
Hardre & Reeve, 2009	Experimental, Pretest-Posttest	2 Sessions, 5 Hours + Follow-up	20 USA Workplace Managers & their 169 Adult Employees	Yes, AS increased: Raters: $d = 1.55$	Employees Increased: • Engagement Employees Decreased: • Amotivation
Kaplan & Assor, 2012	Single Group, Pretest-Posttest	36 Sessions, 54 Hours, 2 Years	18 Israeli Teachers & their 420 7th Grade Students	Yes, AS increased: Students: $d = 0.20$	Students Increased: • Positive Emotions Students Decreased: • Negative Emotions • Classroom Violence

(*continued*)

Table 1. Continued.

Reference citation	Research design	Phases & duration of training	Participants & nation (sample)	Was the intervention effective?	Student and teacher benefits enabled by the intervention
Langan et al., 2015	RCT, Longitudinal	2 Sessions, 2 Hours + Follow-up, 2 Weeks	10 Australian Coaches & their 76 Adolescent Athletes	Yes, AS increased: Raters: $d = 0.38$ Yes, TC decreased: Raters: $d = 0.47$	Students Decreased: • Burnout
Langdon et al., 2017	Single Group, Pretest-Posttest	2 Sessions, 4 Hours + Follow-up 3 Weeks	12 USA Teaching Assistants & their 828 University Students	Yes, AS increased: Students: $d = 0.27$ Teachers: $d = 1.92$ Yes, TC decreased: Teachers: $d = 1.56$	
Mahoney et al., 2016	Quasi-Experimental, Longitudinal	2 2-hour Workshops + Follow-up	18 United Kingdom Coaches & their 61 Adolescent Athletes	No, AS unchanged: Students: $d = 0.16$ Raters: $d = 0.25$ No, TC unchanged: Students: $d = 0.08$	
Reeve et al., 2018	Single Group, Pretest-Posttest	3 Sessions, 7.5 Hours, 4 Weeks	42 Korean Teachers & their 663 Elementary Grade Students	Yes, AS increased: Teachers: $d = 0.85$ Yes, TC decreased: Teachers: $d = 0.37$	
Reynders et al., 2019	RCT, Longitudinal	4 Sessions, 10.5 Hours, 9 Weeks	43 Belgian Coaches & their 326 Adolescent Athletes	Yes, AS increased: Athletes: $d = 0.56$ Coaches: $d = 1.61$ No, TC unchanged: Athletes: $d = 0.36$ Yes, TC decreased: Coaches: $d = 2.45$	Students Increased: • Autonomous Motivation • Engagement
Tessier et al., 2008	Experimental, Pretest-Posttest	Not enough information	5 French PE Teachers & their 96 8th to 12th Grade Students	Yes, AS increased: Raters: $d = 0.89$ No, TC unchanged: Raters: $d = 0.52$	
Tessier et al., 2010	Single Group, Pretest-Posttest	1 Session, 4 Hours + Follow-up	3 French PE Teachers & their 185 9th to 11th Grade Students	Yes, AS increased: Raters: various	Students Increased: • Engagement Students Decreased: • Amotivation

RCT: randomized control trial; PE: physical education; AS: autonomy support; TC: teacher control; *d*: effect size statistic (Cohen's *d*); UK: United Kingdom; USA: United States of America; Develop.: development.

Greater teaching skill

Autonomy-supportive interventions help teachers develop the skill they need to enact autonomy-enhancing instructional behaviors in their own classrooms with their own students. As shown in Table 1, 29 autonomy-supportive intervention studies included classroom observers' rating of teachers' enactment of autonomy-supportive instructional behaviors. In 28 of these studies (97%), raters observed a "greater teaching skill" effect.

Greater teaching efficacy

When teachers successfully put their newly acquired autonomy-supportive teaching skill into classroom practice, they gain confidence in their capacity both to enact ASIBs and to produce desired outcomes for their students, which increases their teaching efficacy (Tschannen-Moran & Woolfolk Hoy, 2001). These intervention-enabled gains in teaching efficacy then predict how autonomy supportive teachers become post-intervention (Cheon et al., 2018).

Stronger beliefs about autonomy-supportive teaching

During an intervention, participating teachers come to believe that autonomy-supportive teaching is both effective ("This approach to teaching is effective in terms of motivating and engaging students") and easy to implement ["This approach to teaching is easy and simple (not hard and difficult) to do"].[2] As these beliefs strengthen, teachers tend to become increasing autonomy supportive toward their students (Reeve et al., 2014; Reeve & Cheon, 2016).

Greater reliance on intrinsic instructional goals

Instructional goals are the priorities or sought-after outcomes that teachers build into their lesson plans (Jang, 2019). Instructional goals can be intrinsic (need-satisfying) or extrinsic (need-neglecting) in nature. Participation in an autonomy-supportive intervention leads teachers to a greater reliance on intrinsic instructional goals, and the extent to which teachers adopt and pursue intrinsic instructional goals then predicts how autonomy-supportive they become post-intervention (Cheon et al., 2018; Jang & Reeve, 2021).

Benefits from autonomy-supportive teaching

The fundamental purpose at the heart of an autonomy-supportive intervention is to help teachers produce student benefits. As shown in the rightmost column in Table 1, teacher participation in an autonomy-supportive intervention has been shown to produce numerous student benefits (e.g., greater engagement). Subsequent intervention research showed that teacher participation in the intervention further produced teacher (Cheon et al., 2014) and classroom climate (Cheon et al., 2021a, 2021b) benefits.

[2]Questionnaire items are from the Teaching Scenarios measure (Reeve & Cheon, 2016).

Student benefits

What teachers learn during an autonomy-supportive intervention is how to provide instruction in autonomy-satisfying ways. As shown in the rightmost column in Table 1, autonomy-supportive teaching interventions have been highly successful in increasing students' classroom experiences of autonomy need satisfaction (e.g., Cheon & Reeve, 2013, 2015). These same interventions have also been consistently successful in decreasing students' experiences of autonomy frustration (e.g., Cheon et al., 2019; Tilga et al., 2019) and autonomy dissatisfaction (e.g., Cheon et al., 2019; Reeve et al., 2020). Further, because teachers learn specific teaching practices to support students' intrinsic motivation and internalization of external regulations (recall Figure 1), autonomy-supportive teaching interventions have been shown to produce student gains in both intrinsic motivation and (internalized) identified regulation, though most studies refer to this dependent measure as "autonomous motivation" (Abula et al., 2020; Fin et al., 2019). Finally, autonomy-supportive teaching interventions have been shown to decrease students' classroom experiences of amotivation (Cheon et al., 2016; Cheon & Reeve, 2015) and controlled motivation (e.g., introjected regulation, external regulation; Cheon & Reeve, 2013; Fin et al., 2019; Huescar et al., 2019).

These intervention-enabled gains in students' autonomy satisfaction, intrinsic motivation, and internalization (i.e., identified regulation) are important in their own right, but they are further important because they in turn increase all of the following indicators of students' adaptive academic and personal functioning (see rightmost column in Table 1): classroom engagement (Cheon et al., 2016; Cheon, Reeve, Lee, et al., 2019; Cheon & Reeve, 2013, 2015), agency and initiative (Reeve et al., 2020), self-regulated learning (Flunger et al., 2019); task absorption (Ulstad et al., 2018); course-specific skill development (Cheon et al., 2012, 2020; Manninen et al., 2020); academic achievement (Cheon et al., 2012, 2020; Cheon & Reeve, 2013; deCharms, 1976); course grades (Cheon, Reeve, & Ntoumanis, 2019; Ulstad et al., 2018); positive emotions (Kaplan & Assor, 2012); vitality and well-being (Niemiec & Muñoz, 2019); and a positive self-concept (Cheon, Reeve, & Song, 2019).

Similarly, these intervention-enabled declines in students' autonomy frustration, autonomy dissatisfaction, and amotivation are important in their own right, but they are further important because they in turn decrease all of the following indicators of students' maladaptive academic and personal functioning (see rightmost column in Table 1): classroom disengagement (Cheon et al., 2019); passivity (Reeve et al., 2020); sedentary level (Lonsdale et al., 2013); negative feelings (Flunger et al., 2019; Kaplan & Assor, 2012); problematic peer relationships (Cheon et al., 2019, 2020); burnout (Langan et al., 2015); and acceptance of cheating as okay (Cheon et al., 2018).

Classroom climate benefits

The classroom climate represents the norms, expectations, values, group dynamics, and patterns of communication that

prevail in a given classroom to guide peer-to-peer (student-to-student) interactions and relationships (Hodge & Gucciardi, 2015). A supportive climate is characterized by interpersonal inclusion, cooperation, rich interpersonal ties, egalitarian relationships, verbal encouragement, a focus on task mastery, and working together (Ntoumanis & Vazou, 2005). A conflictual climate, on the other hand, is characterized by a focus on social status, proving one's worth (e.g., ego-involvement), hierarchical relationships, social comparison, social dominance, interpersonal conflict, normative ability hierarchies, and interpersonal competition (Ntoumanis & Vazou, 2005). What intervention-enabled increases in autonomy-supportive teaching do is allow the teacher to bend or skew the developmental trajectory of students' in-class interactions toward egalitarian relationships and interpersonal support and away from social hierarchy and interpersonal conflict (Assor et al., 2018; Cheon, Reeve, & Ntoumanis, 2019).

To affect a constructive change in the classroom climate, teachers (1) learn how to enact each autonomy-supportive act of instruction not only at the individual student level but also at the level of the whole class (e.g., take the perspective of the whole class) and (2) initiate teacher-to-whole-class dialogues in which the teacher invites students collectively to say how they feel, how they perceive issues that concern them, and what they might want to improve and change about the class (Assor et al., 2018; Kaplan & Assor, 2012). In both cases, the unit of analysis becomes the classroom (not the individual student), as teachers focus on class-wide rules, expectations, and norms (not just students' individual motivational states). In the language of hierarchical level modeling, supporting students' autonomy occurs (and produces benefits) at both the individual (Level 1) and classroom (Level 2) levels. What is particularly interesting about these studies is that sophisticated statistical methodologies (e.g., doubly latent multilevel structural equation modeling; Marsh et al., 2011; Morin et al., 2014) allow researchers to assess classroom climate effects as classroom-level (L2) effects that are statistically independent of students' individually-experienced motivational states (L1 effects, such as autonomy satisfaction and autonomy frustration).

Because teachers who participate in an autonomy-supportive intervention learn how to affect a constructive change in the classroom climate (more supportive, less conflictual; Cheon et al., 2021a, 2021b), these teachers are able to promote students' adaptive social functioning and to diminish students' maladaptive social functioning. That is, autonomy-supportive teaching interventions have been shown to produce student gains in caring (Assor et al., 2018) and prosocial behavior (Cheon et al., 2018, 2019, 2021a, 2021b), as well as student declines in problematic relationships (Cheon et al., 2019), antisocial behavior (Cheon et al., 2018; Cheon, Reeve, & Ntoumanis, 2019; Cheon et al., 2021a), classroom violence (Assor et al., 2018; Kaplan & Assor, 2012), self-rated bullying (Cheon et al., 2021b), and teacher-rated bullying (Cheon et al., 2021b).

Teacher benefits

During the early intervention studies, some teachers voiced the following sentiment: "Students get all the benefits. What about us—do we benefit in any way?" None of the early intervention studies assessed for teacher benefits, but a pioneering study of peer-to-peer friendships showed that the person giving autonomy support experienced the same benefits (in terms of psychological well-being) as did the person receiving it (Deci et al., 2006). This finding led to the hypothesis that teachers might benefit from giving autonomy support as much as their students benefited from receiving it.

This "giving autonomy support produces benefits" hypothesis was based on three processes. First, once teachers become more autonomy supportive, they gain a greater capacity to enhance their students' motivation and classroom functioning. Gaining such teaching skill tends to promote one's sense of competence, teaching efficacy, and job satisfaction. Second, gaining and implementing such teaching skill allows teachers to change the classroom dynamics for the better (e.g., greater classroom engagement, more prosocial behavior), which might be expected to enable a more positive relationship with one's students. Third, correlational studies showed that autonomy-supportive teachers reported relatively high levels of their own need satisfaction, autonomous motivation for teaching, and well-being (Roth et al., 2007; Stebbings et al., 2012; Taylor et al., 2008), which suggested that there may be motivational and well-being benefits to autonomy-supportive teaching.

Intervention-based research confirmed that teachers randomly assigned to participate in the intervention showed numerous teacher benefits, compared to teachers in a control group, including gains in their own need satisfaction during teaching (Aelterman et al., 2013; Cheon et al., 2018), autonomous motivation to teach (Cheon et al., 2014), passion for teaching (i.e., harmonious passion; Cheon et al., 2020), job satisfaction and vitality while teaching (Cheon et al., 2014), and teacher-student relationship satisfaction (Cheon et al., 2020), as well as declines in their emotional-physical exhaustion from teaching (Cheon et al., 2020). In addition, as discussed earlier, teacher participation in an autonomy-supportive intervention has been shown to enable gains in teaching efficacy, intrinsic instructional goals adoption, and positive beliefs about autonomy-supportive teaching (Aelterman et al., 2013, 2016; Cheon et al., 2014, 2018, 2020; Reeve & Cheon, 2016). Overall, these findings give credence to the old dictum that "it is better to give than to receive."

Potential of autonomy-supportive teaching to improve educational practice

Autonomy-supportive teaching holds much promise as an approach to instruction. Much of this promise can be seen in its malleability and capacity to produce student, classroom climate, and teacher benefits. However, before autonomy-supportive teaching can realize its potential to improve educational practice, it first needs to resolve the question as

to whether all teachers (or only a subset of teachers) can learn and benefit from greater autonomy-supportive teaching.

Can all teachers learn how to become more autonomy supportive?

Most teachers who participate in an autonomy-supportive intervention cognitively assimilate its autonomy-supportive message, respond favorably to the recommended instructional behaviors, and display objective evidence that they have become more autonomy supportive toward students during their classroom instruction (about 90% of teacher-participants, according to data supplied by Reeve & Cheon, 2021). Still, some teachers react to the intervention experience with cognitive resistance and subsequently demonstrate little or no change in their post-intervention autonomy-supportive teaching (Reeve, 1998). Recognizing this, researchers investigated why teachers report wide differences in their pre-intervention tendency toward autonomy-supportive teaching and whether two possible conditions might limit the intervention effect (and hence the malleability of autonomy-supportive teaching)—personality and culture.

Personality as a possible limiting condition

Agreeableness, openness to experience, an autonomy causality orientation, and the personal growth initiative all predict which teachers are most likely to harbor a high, rather than low, pre-intervention (baseline) autonomy-supportive motivating style (Reeve et al., 2018). Authoritarianism and a control causality orientation, on the other hand, predict which teachers are most likely to harbor a controlling pre-intervention motivating style (Reeve, 1998; Reeve et al., 2018; Van den Berghe et al., 2013, 2015). Authoritarianism is the belief that subordinates should submit to and obey authority figures (Altemeyer, 1996). Out of this belief, authoritarian teachers emphasize conformity to prevailing social norms, submission to legitimate authority, and the necessity of using coercion to ensure conformity (Altemeyer, 1998). A control causality orientation tends teachers toward believing that external incentives and attractive rewards, social expectations and pressures, and external controls (rather than internal causalities) are the reliable and effective sources of student motivation. In terms of the malleability of autonomy-supportive teaching, the control causality orientation has emerged as the most prevalent personality-based limiting condition to the intervention effect (Reeve et al., 2018). This is because teachers who embrace a relatively high control causality orientation have difficulty seeing the connection between autonomy-supportive teaching and gains in students' classroom motivation and engagement (Van den Berghe et al., 2015).

Culture as a possible limiting condition

Cultures vary in their values, priorities, ideals, and definitions of success, and cultures use these aspirations to set expectations, establish norms, prescribe attitudes toward authorities, legitimize hierarchies, and communicate what is desirable and acceptable. Through these processes, the culture in which the teacher lives and works can affect what acts of instruction represent "best practices" (Oyserman & Lee, 2008). For instance, teachers in hierarchical cultures tend to prioritize group needs and submission to authority over individual needs and personal agency. In doing so, these teachers tend toward controlling teaching practices as an effective pathway to cultural priorities such as students' discipline, duty, academic achievement, and entrance to prestigious schools (Ng et al., 2014; Pan et al., 2013; Reeve et al., 2014; Yu et al., 2018). Teachers in egalitarian cultures (e.g., a Montessori educational system), on the other hand, tend to prioritize individual needs and student agency over group needs and submission to authority. In doing so, these teachers tend to embrace autonomy-supportive teaching practices as an effective pathway to personal priorities such as students' interests, agency, and self-determination (Lillard, 2019).

Because cultures vary in their priorities, cultural membership can affect one's baseline motivating styles. But the effect of culture (or nationality) is mostly to orient teachers toward controlling teaching rather than away from autonomy-supportive teaching. In one investigation that assessed the motivating styles of teachers in eight different nations, nationality explained 8.4% of the between-nation variance in controlling teaching but only 3.1% in autonomy-supportive teaching (Reeve et al., 2014). In addition, neither nationality nor a collectivistic cultural orientation affected (moderated) teachers' beliefs about how effective and how easy-to-do autonomy-supportive teaching was. These findings help explain why students in practically any global classroom benefit from autonomy-supportive teaching (Chirkov & Ryan, 2001; Downie et al., 2004; Nalipay et al., 2020; Roth et al., 2009; Taylor & Lonsdale, 2010; Zhou et al., 2009). Thus, while culture may substantially affect a teacher's pre-intervention baseline motivating style, culture appears to be only a weak limiting condition to the intervention effect. After all, the studies listed in Table 1 (see column 4) provide evidence of successfully conducted autonomy-supportive interventions across 17 different nations, including Australia, Belgium, Brazil, China, Columbia, Estonia, Finland, France, Germany, Greece, Israel, Korea, Norway, Singapore, Spain, the United Kingdom, and the United States.

That said, nations vary widely in how strongly their teachers desire, seek out, and respond favorably to opportunities for professional development. Teachers in China, Singapore, and Korea, for instance, are generally passionate about professional development (Tan, 2013), while teachers in some other nations take a less enthusiastic attitude toward these same opportunities. The question as to whether a teacher's desire for professional development might moderate the intervention effect has not yet been put to empirical test, but we suspect that if culture moderates the intervention effect, it will likely do so through this desire (vs. apathy) for professional development (such as the autonomy-supportive teaching intervention experience).

Can autonomy-supportive teaching enhance structure and involvement?

According to self-determination theory (Ryan & Deci, 2017, 2020), all students possess three psychological needs, including those for autonomy—the need for personal ownership over one's behavior and for experiences of volition and self-endorsement during behavior, competence—the need for optimal challenges and for experiences of effectance and mastery, and relatedness—the need for close relationships and for experiences of belongingness and feeling emotionally connected to others. Intervention-enabled gains in autonomy-supportive teaching have been shown to increase all three of these psychological needs (Cheon et al., 2012; Cheon & Reeve, 2013; Zhang et al., 2020). Nevertheless, because students have three (not just one) psychological needs, it makes sense to consider the possibility of expanding an autonomy-supportive intervention into a needs-supportive intervention.

Interventions have been designed and implemented to help teachers learn autonomy support to satisfy autonomy, structure to satisfy competence, and involvement to satisfy relatedness (Edmunds et al., 2008; Franco & Coteron, 2017; Langan et al., 2015; Leyton et al., 2017; Meng & Wang, 2016; Sanchez-Oliva et al., 2017; Tessier et al., 2008, 2010). These studies often produced significant student benefits, but many null results were also reported. The range of student benefits observed in these multicomponent (i.e., needs-supportive) interventions was also more limited than the range of student benefits observed in the single-component autonomy-supportive interventions. The observed effect sizes were also consistently lower. These modest results emerged for one primary reason.[3]

While autonomy support by itself yields numerous benefits, structure (i.e., competence support) and involvement (i.e., relatedness support) by themselves sometimes do not. When providing structure, the teacher communicates clear expectations, provides guidance for how students can meet those expectations and attain desired outcomes, and provides constructive feedback. But any of these individual elements of classroom structure can be provided in either an autonomy-supportive way (e.g., with perspective taking, choice, and an understanding tone) or a controlling way (e.g., with pressure, demands, and a harsh tone). While structure (e.g., rules, praise, feedback, assessment criteria) presented in an autonomy-supportive way consistently generates numerous benefits, structure presented in a controlling way actually undermines motivation and generates few benefits (Assor et al., 2018; Carpentier & Mageau, 2013, 2016; Curran et al., 2013; Eckes et al., 2018; Haerens et al., 2018; Koestner et al., 1984; Mouratidis et al., 2010; Trouilloud et al., 2006). This same effect has been found for teacher-provided involvement, as any individual element of involvement provided in a neutral (Sparks et al., 2017) or controlling (Assor et al., 2004; Pan et al., 2013; Roth et al., 2009) way tends to generate controlling (i.e., autonomy suppressive) types of motivation (i.e., guilt-inducing introjection, conditional regard) and therefore only modest or no benefits.

Two intervention studies have been explicitly designed to compare three conditions: autonomy support only, autonomy support + structure, and a no-intervention control (Cheon et al., 2019; Meng & Wang, 2016). In both studies, students experienced greater benefits when their teachers were in the autonomy support + structure condition than when their teachers were in the autonomy support only condition. When combined with the earlier studies investigating the effects of structure on student outcomes, these findings suggest that what students benefit from is not structure only but structure provided in an autonomy-supportive way. We therefore suggest that instead of pursuing multicomponent needs-supportive interventions, researchers consider designing and implementing future interventions as suggested in Figure 2. We suggest that what will be most effective, efficient, and well-received is to have teachers first complete an autonomy-supportive intervention. Once done, it would be an easy next step to learn how to present any element of structure or involvement in an autonomy-supportive way. When teachers have participated in interventions designed and implemented in this way, a wide range of student and teacher benefits have been consistently observed (Assor et al., 2018; Cheon, Reeve, & Song, 2019; Cheon et al., 2020).

Culturally responsive teaching

Culturally responsive teaching is an approach to instruction that recognizes the importance of including students' cultural references in all aspects of learning (Ladson-Billings, 1994). When teachers work with students from a different culture or socio-economic status, high-quality teacher preparation and professional development are crucial prerequisites (Yarrow et al., 1999). These teachers need a deep appreciation and respect for their students' values, goals, perspective, worldview, obstacles, and preferred instructional methods. In practice, this means a great deal of teacher perspective taking, adaptation, and accommodation. For this reason, we suspect that teacher participation in an autonomy-supportive intervention may be a helpful catalyst to incorporate culturally-informed, responsive, sensitive, and relevant teaching recommendations (Aronson & Laughter, 2016; Patall & Zambrano, 2019).

Technology

We suggest three ways that technology can be integrated into future autonomy-supportive intervention research to improve educational practice. First, because the "how to" of autonomy-supportive teaching is known (e.g., Figure 1), a smartphone app (application) could be programmed to

[3]A second possible reason is that it is easier for teachers to learn the skill within a single-component (autonomy support) rather than a multi-component (autonomy support, structure, and involvement) intervention. An intervention to help teachers simultaneously learn one set of instructional strategies to support autonomy, another set to support competence, and still another set to support relatedness may simply be asking too much of teachers, given its demands on teachers' time and resources. Multicomponent interventions typically require teachers to participate in more phases of the intervention, more hours and more weeks of participation, and more follow-up activities (as per column 3 in Table 1).

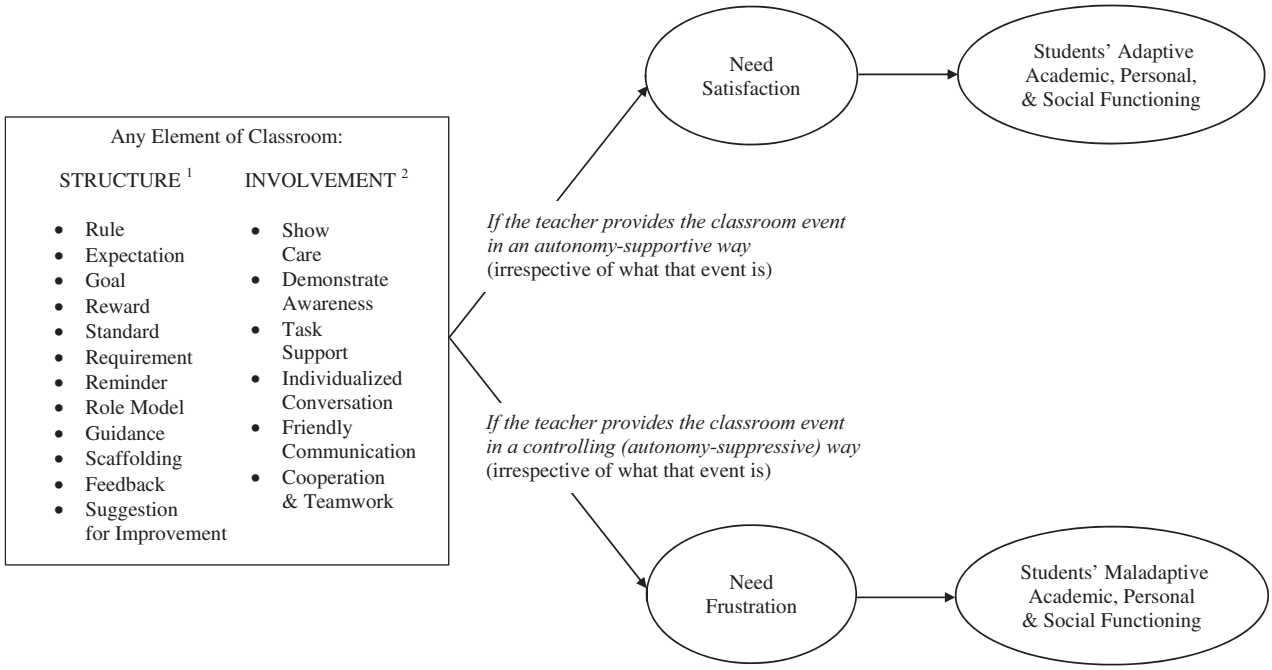

Figure 2. Benefits of presenting any element of classroom structure or involvement in an autonomy-supportive way, and the costs of presenting any element of classroom structure or involvement in a controlling (autonomy-suppressive) way.
[1]Elements of structure are from Reeve (2015).
[2]Elements of involvement are from Sparks et al. (2016).

recognize the presence vs. absence of autonomy-supportive instructional behaviors during a teacher's instruction. A teacher could then use the app to record his or her classroom instruction to produce autonomy-supportive teaching scores for that day's speech prosody, speech content, and teaching practices. Such daily software-generated scores could be used both as a source of feedback and as a training tool to develop the skill of autonomy-supportive teaching.

Second, while practically all autonomy-supportive interventions have been conducted using a face-to-face delivery, two successful interventions have been delivered using an online or web-based format (Perlman, 2011; Tilga et al., 2019). By using an online delivery, the intervention experience could become more personalized, self-paced, and include additional or supplemental materials, such as a video presentation of an exemplary autonomy-supportive teacher who provides a voice-over to explain what he or she was doing and why.

Third, recent international investigations of global teaching have collected video recordings of hundreds of teachers providing classroom instruction across many different nations (e.g., see globalteachinginsights.org). Such a data base opens up many new possibilities to study autonomy-supportive teaching internationally and to facilitate cross-national collaborations to generate and discuss best practices. Such a data base also opens up new possibilities to study national membership as a potential moderator of both naturally-occurring autonomy-supportive teaching and the intervention effect (i.e., post-intervention gains in autonomy-supportive teaching).

Can autonomy-supportive teaching be done poorly?

Autonomy-supportive teaching is rooted in a student-focused approach to instruction. Given this starting point, it is possible to miss-apply autonomy-supportive teaching as a laissez-faire style. Laissez-faire teaching is an approach to instruction in which students are left on their own to take the initiative and responsibility for their own learning and developing (Aelterman et al., 2019).

While autonomy support and laissez-faire do share a student focus, they differ in that autonomy support is a motivationally supportive approach that energizes students' autonomy satisfaction while laissez-faire is a demotivating approach that leads to students' autonomy frustration (Aelterman et al., 2019). This difference can be seen most clearly on those occasions when students struggle and become discouraged, as a teacher with a laissez-faire style would leave students to figure things out for themselves while a teacher with an autonomy-supportive style would approach students to take their perspective, acknowledge their negative feelings as understandable, ask for student input and problem diagnosis, and provide the resources needed to overcome the problem and make progress. Not surprisingly, students of laissez-faire teachers tend to report high amotivation, show poor self-regulation, and submit poor teaching evaluations (e.g., "I would *not* recommend this teacher to other students") (Aelterman et al., 2019). Thus, if autonomy-supportive teaching is misunderstood or done poorly, the reason is because the teacher overlooked the "support" aspect of "autonomy support".

Conclusion

A review of 51 autonomy-supportive teaching interventions supports two core conclusions: (1) researchers have used self-determination theory principles and empirical findings to develop teacher-focused professional developmental experiences (interventions) that are fully capable of helping teachers

learn greater autonomy-supportive teaching and (2) after teachers use the intervention experience to become more autonomy supportive they then become more able to produce a wide-range of educationally important student, classroom climate, and teacher benefits. Because autonomy-supportive teaching is both malleable and beneficial, it offers meaningful potential to improve current and future educational practice.

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